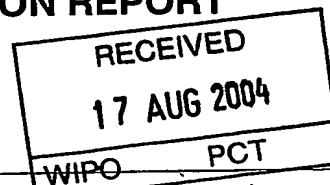


PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT (PCT Article 36 and Rule 70)



Applicant's or agent's file reference I16155WO-ALM/jw	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/GB 03/01743	International filing date (day/month/year) 24.04.2003	Priority date (day/month/year) 08.05.2002
International Patent Classification (IPC) or both national classification and IPC F26B5/12		
Applicant O.N. BECK & CO. LTD. et al.		



- This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
- This REPORT consists of a total of 5 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

 These annexes consist of a total of 10 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the opinion
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 27.11.2003	Date of completion of this report 16.08.2004
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Frank, H Telephone No. +49 89 2399-2695 

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/GB 03/01743

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

1, 5, 6	as originally filed
7, 8	received on 07.05.2004 with letter of 06.05.2004
2, 3, 4	received on 23.07.2004 with letter of 23.07.2004

Claims, Numbers

1-14	received on 23.07.2004 with letter of 23.07.2004
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Drawings, Sheets

1/4, 2/4	received on 23.07.2003
3/4, 4/4	received on 07.05.2004 with letter of 06.05.2004

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. **PCT/GB 03/01743**

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-14
	No: Claims	
Inventive step (IS)	Yes: Claims	1-14
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-14
	No: Claims	

2. Citations and explanations

see separate sheet

***Ad Item V - Reasoned statement under Article 35(2) with regard to novelty,
inventive step or industrial applicability / Citations and explanations supporting
such statement***

1. Claim 1

1. Claim 1

Document GB-A-2 276 708, which is to be viewed as the nearest prior art, discloses a method of de-watering an article subjected to processing in which a liquid, such as water, collects on a surface of the article, which method comprises

- conveying the article past a suction device so that the said surface of the article passes adjacent to an inlet of the suction device,
- directing at least one jet of air at the said surface of the article as the said surface passes by the inlet of the suction device to displace liquid from the said surface of the article into the air adjacent to the inlet of the suction device, and
- operating the suction device to draw the liquid-containing air into the inlet of the suction device.

The remaining features of claim 1, i. e.

- "that the suction device comprises an air moving device which is based on the Coanda effect and which comprises a tubular body having an inlet opening at one end and an outlet connection at the other end; and
- the or each jet of air is directed at the surface of the article through a nozzle located in the inlet opening of the tubular body",

are nowhere indicated in the available prior art documents. Moreover, these features appear to improve the effectiveness of the air jet in breaking up the surface tension of water and in displacing the water from the surface of the article.

In US-A-4 477 287 an air knife drives liquid along the surface of a sheet or strip towards a vacuum device. The resulting liquid is then sucked from the surface of the sheet or strip.

EP-A-0 679 849 suggests applying a high speed air jet and a negative pressure air stream simultaneously to an article to be dried. The water adhering to the article is thereby divided into fine droplets which are sucked from the article.

The subject-matter defined in claim 1 is thus both new and inventive in the light of the cited documents. Since the industrial applicability is to be readily recognised due to its intended use, the subject-matter of claim 1 would appear to satisfy the criterion set forth in Articles 33(2), (3) and (4) PCT.

2. Claim 8

Claim 8 defines basically the method steps of claim 1 in terms of apparatus features. Therefore, above criteria also apply for the independent apparatus claim 8.

The apparatus according to independent apparatus claim 8 is thus also new and inventive and the present application satisfies the criterion set forth in Articles 33(2), (3) and (4) PCT.

3. Claims 2 to 7 and 9 to 14

Claims 2 to 7 and 9 to 14 contain modifications of the inventive features of claim 1, resp. claim 8 and also appear to meet the requirements of Articles 33(2), (3) and (4) PCT.

Certain observations on the international application

Dependent claims 2 and 9 should have used the direct article for the nozzle already defined in the independent claims.

canning operation very unpleasant and can disperse biological hazards into the atmosphere. Finally, the known de-watering apparatus is not energy efficient.

GB-A-2 276 708 discloses a method and apparatus in accordance with the preamble of claims 1 and 8.

The present invention aims to provide a de-watering method and apparatus which overcomes at least some of these disadvantages of the known process and apparatus

Accordingly, in a first aspect, the invention provides a method of de-watering an article subjected to processing in which a liquid, such as water, collects on a surface of the article, which method comprises: conveying the article past a suction device so that the said surface of the article passes adjacent to an inlet of the suction device; directing at least one jet of air at the said surface of the article as the said surface passes by the inlet of the suction device to displace liquid from the said surface of the article into the surrounding air; and operating the suction device to draw the liquid-containing air into the inlet of the suction device; characterised by using a suction device comprising an air moving device which is based on the Coanda effect and which comprises a tubular body having an inlet opening at one end and an outlet connection at the other end; and directing the or each jet of air at the surface of the article through a nozzle located in the inlet of the suction device.

In one embodiment, the method comprises directing a jet of air at the said surface of the article through a nozzle positioned centrally within the inlet opening of the tubular body. Conveniently, the method comprises delivering compressed air to the nozzle from a source of compressed air through a compressed air pipe extending within the suction device.

Advantageously, the method comprises detecting the presence of an article adjacent to the inlet opening of the tubular body and directing a pulse of air at the said surface of the article in response to the detection of the article.

In another embodiment, the method comprises directing a plurality of jets of air at the said surface of the article through a plurality of nozzles distributed around the periphery of the inlet opening of the tubular body. Advantageously, the method comprises supplying compressed air to the plurality of nozzles from a chamber of the tubular body which is connected to a source of compressed air.

In an exemplary embodiment of the invention, the method comprises conveying the articles beneath the inlet opening of the tubular body.

In another aspect, the invention provides apparatus for de-watering an article subjected to processing in which a liquid, such as water, collects on a surface of the article, which apparatus comprises: a suction device having an inlet; means for conveying the article past the suction device so that the said surface of the article passes adjacent to the inlet of the suction device; and means for directing at least one jet of air at the said surface of the article as the surface passes by the inlet of the suction device to displace liquid from the said surface of the article into the air adjacent the inlet of the suction device; characterised in that the suction device comprises an air moving device which is based on the Coanda effect and which comprises a tubular body having an inlet opening at one end and an outlet connection at the other end; and the means for directing the or each jet of air at the said surface of the article comprises a nozzle located in the inlet opening of the suction device.

In one embodiment, the means for directing at least one jet of air at the said surface of the article comprises a nozzle positioned centrally within the inlet opening of the tubular body.

Conveniently, the nozzle is connected to a supply of compressed air by a compressed air pipe extending within the suction device.

Advantageously, the apparatus comprises means for detecting the presence of an article adjacent to the inlet opening of the tubular body and means for directing a pulse of air at the said surface of the article in response to the detection of the article by the detecting means.

In order that the invention may be more readily understood, an embodiment thereof will now be described, by way of example, with reference to the accompanying drawings, in which:

FIGURE 1 is a schematic representation of one embodiment of a de-watering apparatus according to the present invention;

FIGURE 2 is a schematic cross-sectional view of a suction device used in the de-watering apparatus of FIGURE 1, illustrating the way in which the suction device operates;

FIGURE 3 is a schematic representation of another embodiment of a de-watering apparatus according to the present invention: and

FIGURE 4 is an end view of the apparatus of FIGURE 3.

In contrast to the known de-watering apparatus which uses streams of air simply to blow water from the end surfaces of the cans into the ambient air, the apparatus embodying the invention is quiet in operation, is energy efficient and provides a much more pleasant and healthy working environment in which the displaced water is removed from the ambient air and collected for subsequent disposal to a drain or re-circulation within the system.

FIGURES 3 AND 4 illustrate a second de-watering apparatus 21 embodying the invention, parts of this second embodiment which correspond to like parts of the first embodiment shown in FIGURES 1 and 2 being indicated by like reference numerals. Like the first embodiment, the second embodiment of the apparatus employs a Coanda effect suction device 4 having an inlet opening 6 beneath which a can to be de-watered is conveyed.

As shown in FIGURES 3 and 4, however, the second embodiment differs from the first in having a plurality of air jets, in the form of four micro jets 30 each having an internal diameter of 0.05 mm, equally spaced around the inlet opening 6 of the suction device 4 instead of a single air jet 10 centrally positioned in the inlet opening 6 as in the first embodiment.

The air jets 30 are mounted on, and extend through, the curved inlet surface 13A of the suction device 4, so that they communicate with the chamber 17 of the suction device 4 and are supplied with compressed air from the chamber 17. The air jets 30 are arranged so to project slightly from the inlet opening 6 and are angled slightly towards the central axis 12A of the main tube 12 so that they deliver slightly convergent streams of air directed away from the inlet opening 6 of the suction device 4. In operation, the outwardly directed air streams from the air jets 30 serve to displace water from the depression 2 of a can 3 arriving

beneath the suction device 4 into the air adjacent the inlet opening 6 for removal by the suction device 4.

Since the air jets 30 of the second embodiment receive their compressed air supply directly from the suction device 4 itself, the air jets of the second embodiment do not require a separate compressed air supply like the pulsed air supply arrangement provided in the first embodiment for the air jet 10.

In the present specification "comprises" means "includes or consists of" and "comprising" means "including or consisting of".

CLAIMS:

1. A method of de-watering an article (3) subjected to processing in which a liquid, such as water, collects on a surface (2) of the article, which method comprises: conveying the article (3) past a suction device (4) so that the said surface (2) of the article passes adjacent to an inlet (6) of the suction device; directing at least one jet of air at the said surface (2) of the article (3) as the said surface passes by the inlet (6) of the suction device (4) to displace liquid from the said surface of the article into the air adjacent to the inlet of the suction device; and operating the suction device (4) to draw the liquid-containing air into the inlet (6) of the suction device; characterised by: using a suction device (4) comprising an air moving device which is based on the Coanda effect and which comprises a tubular body (5) having an inlet opening (6) at one end and an outlet connection (7) at the other end; and the or each jet of air is directed at the surface (2) of the article (3) through a nozzle (10; 30) located in the inlet opening (6) of the tubular body (5).
2. A method according to claim 1 comprising directing a jet of air at the surface (2) of the article (3) through a nozzle (10) positioned centrally within the inlet opening (6) of the tubular body (5).
3. A method according to claim 2 comprising delivering compressed air to the nozzle (10) from a source of compressed air (20) through a compressed air pipe (9) extending within the suction device (4).

4. A method according to any one of claims 1 to 3 comprising detecting (22) the presence of an article (3) adjacent to the inlet opening (6) of the tubular body (5) and directing a pulse of air at the said surface of the article in response to the detection of the article.

5. A method according to claim 1 comprising directing a plurality of jets of air at the said surface (2) of the article (3) through a plurality of nozzles (30) distributed around the periphery of the inlet opening (6) of the tubular body (5).

6. A method according to claim 5 comprising supplying compressed air to the plurality of nozzles (30) from a chamber (17) of the tubular body (5) which is connected to a source of compressed air.

7. A method according to any preceding claim comprising passing the articles (3) beneath the inlet opening (6) of the tubular body (5).

8. Apparatus (1) for de-watering articles (3) subjected to processing in which a liquid, such as water, collects on a surface (2) of the article, which apparatus comprises: a suction device (4) having an inlet (6) ; means for conveying an article (3) past the suction device (4) so that the said surface (2) of the article passes by the inlet (6) of the suction device; and means (10, 9, 20, 21; 30, 17, 8) for directing at least one jet of air at the said surface (2) of the article (3) as the surface passes by the inlet (6) of the suction device (4) to displace liquid from the said surface of the article into the air adjacent the inlet of the suction device; characterised in that: the suction device (4) comprises an air moving device which is based on the Coanda effect and which comprises a tubular body (5) having an inlet opening (6) at one end and an outlet connection (7) at the other end; and the means for directing the or each jet of air at the said

surface (2) of the article (3) comprises a nozzle (10; 30) located in the inlet opening (6) of the tubular body (5).

9. Apparatus according to claim 8 wherein the means (20, 21, 9, 10) for directing the jet of air at the said surface (2) of the article (3) comprises a nozzle (10) positioned centrally within the inlet opening (6) of the tubular body (5).

10. Apparatus according to claim 8 or 9 wherein the nozzle (10) is connected to a source of compressed air (20) by a compressed air pipe (9) extending within the suction device (4).

11. Apparatus according to any one of claims 8 to 10 comprising means (22) for detecting the presence of an article (3) adjacent to the inlet opening (6) of the tubular body (5) and means (21) for directing a pulse of air at the said surface of the article in response to the detection of the article by the detecting means (22).

12. Apparatus according to claim 8 wherein the means for directing the jet of air at the said surface (2) of the article (3) comprises a plurality of nozzles (30) distributed around the inlet opening (6) of the tubular body (5).

13. Apparatus according to claim 12 wherein the plurality of nozzles (30) are equally spaced around the inlet opening (6) of the tubular body (5).

14. Apparatus according to claim 12 or 13 wherein the plurality of nozzles (30) are mounted on the tubular body (5) and are supplied with pressurised air from a chamber (17) of the tubular body (5) which is connected to a source of compressed air.

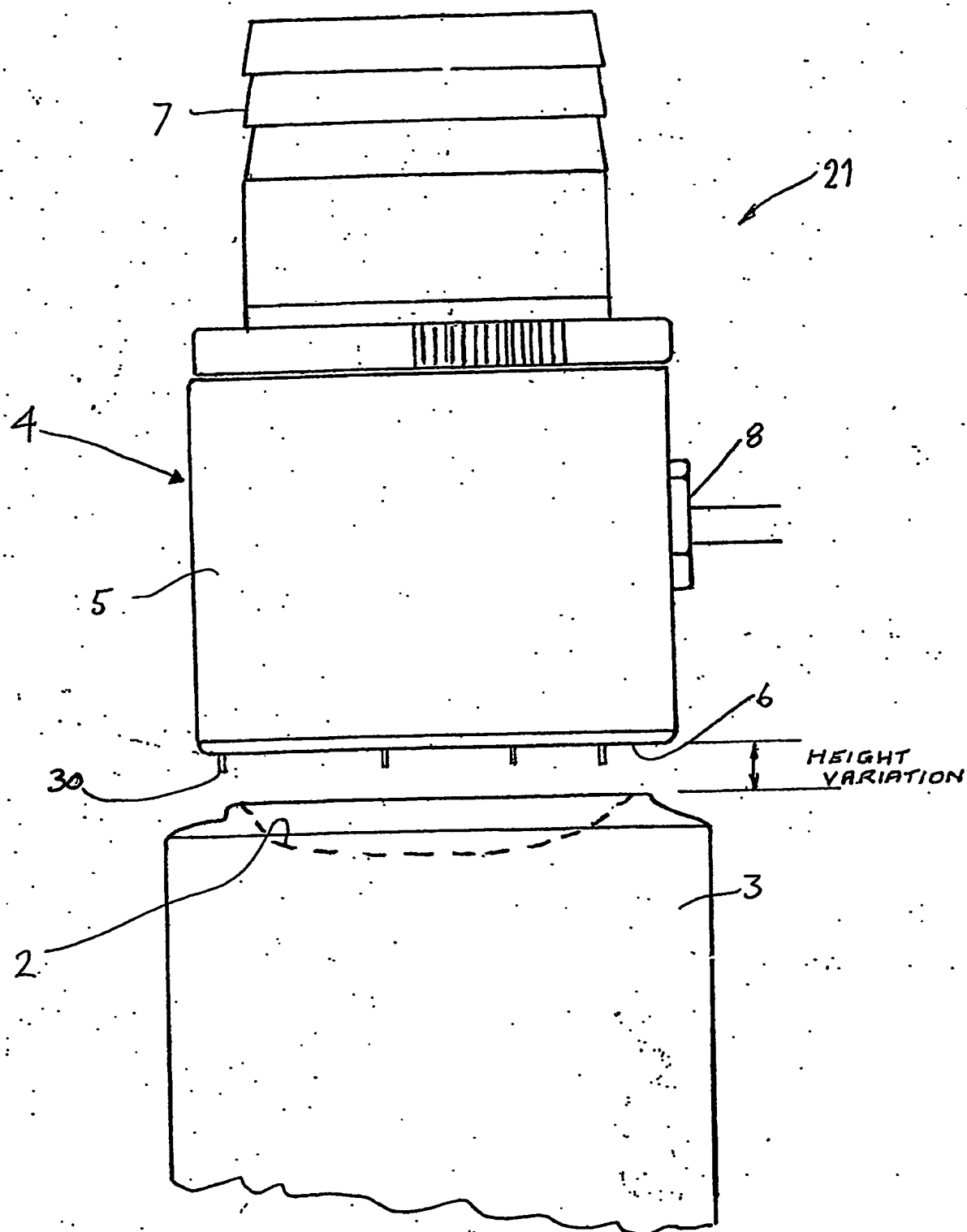
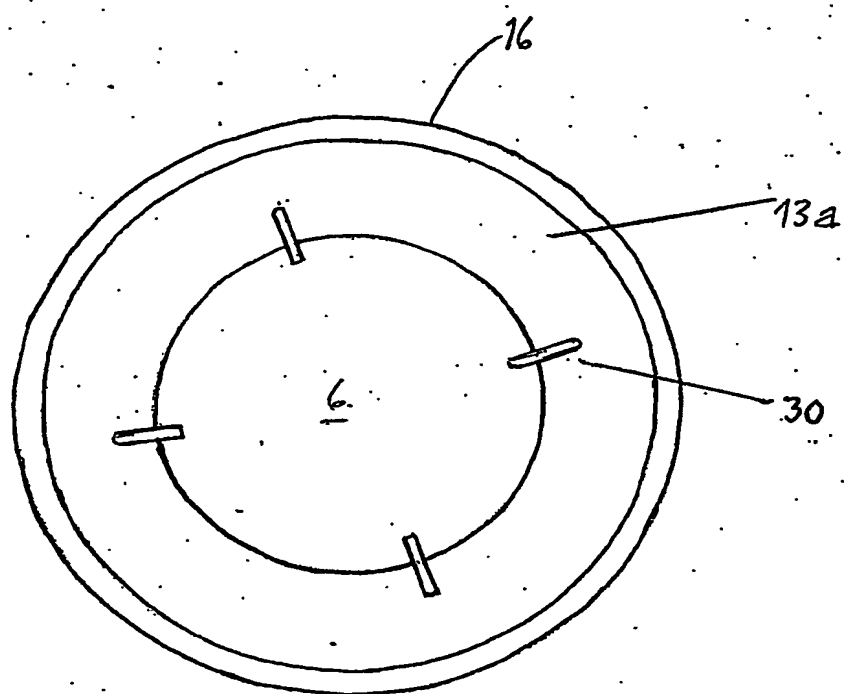


FIGURE 3

4/4

FIGURE 4